

**USGS-NPS Vegetation Mapping Program**  
**Walnut Canyon National Monument**

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*Pinus ponderosa* / *Quercus gambelii* Woodland

MAP CLASS	Ponderosa Pine / Gambel Oak Woodland, Canyon Floor Complex
COMMON NAME	Ponderosa Pine / Gambel Oak Woodland
PHYSIOGNOMIC CLASS	Woodland (II.)
PHYSIOGNOMIC SUBCLASS	Evergreen woodland (II.A.)
PHYSIOGNOMIC GROUP	Temperate or subpolar needle-leaved evergreen woodland (II.A.4.)
PHYSIOGNOMIC SUBGROUP	Natural/Semi-natural (II.A.4.N.)
FORMATION	Rounded-crowned temperate or subpolar needle-leaved evergreen woodland (II.A.4.N.a.)
ALLIANCE	<i>Pinus ponderosa</i> Woodland Alliance

CLASSIFICATION CONFIDENCE LEVEL Strong

USFS WETLAND SYSTEM Upland

**RANGE**

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Ponderosa Pine / Gambel Oak Woodland is a common association within Walnut Canyon NM and in the environs. It is found, from our relevé data, to occur in riparian habitats as well as in non-canyon environments in the western section of the park. The riparian mesic relevés were located in Walnut Canyon as well as in its side canyons, specifically occurring in Cherry Canyon. The non-canyon relevés were found on the north rim west of the visitor's center and on the south rim west of Anderson Mesa.

**Globally**

This ponderosa pine woodland association is widespread in the southern Rocky Mountains and southwestern U.S. and occurs in foothills, mountains and plateaus from Colorado to Trans-Pecos, Texas, west to Arizona and Nevada.

**ENVIRONMENTAL DESCRIPTION**

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This association ranged from 6,430-7,218 ft (1,960-2,200 m) (average 6,791 ft/2,070 m). The topography varied from steep canyon walls to flat areas with 0-80% slope (average 17%).

**Globally**

This woodland association is widespread and has been reported from foothills, mountains and plateaus from Colorado to Trans-Pecos Texas, west to Arizona and Nevada. Elevation ranges from 1,830-2,800 m (6,000-9,200 ft). Stands often occur along drainages, on lower and middle slopes and benches on all aspects. Slopes are typically gentle or moderate, but may also be steep (>45%). Soils are typically shallow and rocky ranging from sandy loams to clay loams. Parent materials are commonly sandstones, but fractured limestone, basalt, andesite, and alluvium are also reported. High litter cover (70-90%) about 2 in (5 cm) deep is common in many stands. Rock outcrop (about 10%) and some bare soil are not uncommon. This conifer woodland transitions to *Quercus gambelii* Shrubland in drier sites and at lower elevations. This community is the highest elevation *Pinus ponderosa* / *Quercus gambelii* Woodland present in Trans-Pecos, Texas. There, it typically grades downslope to *Pinus ponderosa* / *Quercus hypoleucoides* Woodland (CEGL000872).

**MOST ABUNDANT SPECIES**

**Walnut Canyon National Monument**

<u>Stratum</u>	<u>Species</u>
Tree canopy	<i>Pinus ponderosa</i>
Tall Shrub	<i>Quercus gambelii</i>

**Globally**

<u>Stratum</u>	<u>Species</u>
Tree canopy	<i>Pinus ponderosa</i> , <i>Pinus strobiformis</i>
Tall Shrub	<i>Quercus gambelii</i>

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#### ASSOCIATED SPECIES

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*Bouteloua curtipendula*, *Bouteloua gracilis*, *Elymus elymoides*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Poa fendleriana*, *Pseudotsuga menziesii*, *Rosa woodsii*, *Robinia neomexicana*, *Symphoricarpos rotundifolius* (all occur with >5% cover)

##### Globally

*Amelanchier* spp., *Arctostaphylos patula*, *Artemisia ludoviciana*, *Artemisia tridentata* ssp. *vaseyana*, *Balsamorhiza sagittata*, *Bouteloua gracilis*, *Carex geyeri*, *Carex rossii*, *Cercocarpus montanus*, *Elymus elymoides*, *Erigeron* spp., *Eriogonum* spp., *Festuca arizonica*, *Hymenoxys* spp., *Juniperus communis*, *Juniperus deppeana*, *Juniperus osteosperma*, *Juniperus scopulorum*, *Koeleria macrantha*, *Lithosperma multiflorum*, *Mahonia repens*, *Muhlenbergia longiligula*, *Muhlenbergia montana*, *Packera multilobata*, *Pinus edulis*, *Pinus strobiformis*, *Poa fendleriana*, *Robinia neomexicana*, *Rosa woodsii*, *Schizachyrium scoparium*, *Shepherdia rotundifolia*, *Symphoricarpos oreophilus*, *Wyethia amplexicaulis*

#### VEGETATION DESCRIPTION

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Ponderosa Pine / Gambel Oak Woodland total cover was 30-90% (average 61%) with 15-78% absolute cover (average 48%) in the tree layer, 1-35% (average 9%) in the shrub layer, and 5-48% (average 17%) in the herbaceous layer. The total species diversity ranged from 20-40 species (average 25) within the 16 relevés sampled.

*Pinus ponderosa* dominated the tree layer with 13-35% absolute cover (average 25%). DBH ranged from 4-48 in (11-122 cm) (average 13 in/33 cm). *Quercus gambelii* dominated the shrub layer with 3-34% absolute cover (average 13%); DBH ranged from 4-19 in (11-49 cm) (average 7 in/17 cm). The herbaceous layer contained a variety of herbs and grasses.

##### Globally

This broadly defined coniferous woodland is widespread and is characterized by a sparse to moderately dense, evergreen needleleaf tree canopy dominated by *Pinus ponderosa* or sometimes co-dominated by *Pinus edulis* with scattered *Juniperus scopulorum*, *J. monosperma*, or *J. osteosperma*. In southern stands *Juniperus deppeana* and *Pinus strobiformis* may be present to co-dominant. *Pseudotsuga menziesii* is accidental and *Abies concolor* is not present. *Quercus gambelii* dominates both the subcanopy (tree form, if present) and the typically moderately dense tall-shrub layer, which consists of dense clumps of oak. This community must have at least 5% cover of *Quercus gambelii*, but there is frequently over 25%. At higher elevations, the *Quercus gambelii* are more tree-like and *Symphoricarpos oreophilus* will be present with significant cover in a short-shrub layer. At lower elevations, scattered *Artemisia tridentata* ssp. *vaseyana*, *Pinus edulis*, and *Juniperus osteosperma* are often present. Other common shrub species may include *Arctostaphylos patula*, *Amelanchier* spp., *Cercocarpus montanus*, *Juniperus communis*, *Mahonia repens*, *Robinia neomexicana*, *Rosa woodsii*, and *Shepherdia rotundifolia*. The herbaceous layer is generally sparse (<10% cover), but may equal the shrub cover. It is composed of mostly graminoids such as *Bouteloua gracilis*, *Elymus elymoides*, *Festuca arizonica*, *Koeleria macrantha*, *Muhlenbergia longiligula*, *Muhlenbergia montana*, *Poa fendleriana*, *Schizachyrium scoparium*, and *Carex* spp., especially *Carex geyeri* and *Carex rossii*. Scattered forbs include *Artemisia ludoviciana*, *Balsamorhiza sagittata*, *Eriogonum* spp., *Erigeron* spp., *Hymenoxys* spp., *Lithosperma multiflorum*, *Packera multilobata*, and *Wyethia amplexicaulis*.

CONSERVATION RANK G5

DATABASE CODE Cegl000870

#### MAP CLASSES

The association Ponderosa Pine / Gambel Oak Woodland is represented by map classes Ponderosa Pine / Gambel Oak Woodland (map code 14) and Canyon Floor Complex (map code 10).

The distinguishing feature between the upland map class Ponderosa Pine / Gambel Oak Woodland and the riparian map class Canyon Floor Complex is that the Canyon Floor Complex occurs in more mesic riparian areas. Ponderosa Pine / Gambel Oak Woodland was mapped as occurring in the southwestern half of the project boundary in non-canyon environments and side canyons. The Canyon Floor Complex was mapped as occurring on the canyon

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bottom of Walnut Canyon. The total area of Ponderosa Pine / Gambel Oak Woodland within Walnut Canyon NM is 198 ac (80 ha) within 22 polygons and the total area in the park environs is 1,695 ac (686 ha) within 35 polygons. The total area of Canyon Floor Complex within Walnut Canyon NM is 119 ac (48 ha) within 39 polygons and the total area in the park environs is 32 ac (13 ha) within 23 polygons.

#### COMMENTS

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Due to Walnut Canyon and the adjacent side canyons being narrow, it was difficult to distinguish the occurrence of this association on the aerial photography. Therefore, this association, when it occurs on the canyon bottom, is mapped as part of the Canyon Floor Complex map class.

##### Globally

This ponderosa pine woodland is a broadly defined plant association. Stuever and Hayden (1997b) report 7 phases for this plant association: the *Quercus gambelii*, *Festuca arizonica*, *Muhlenbergia longiligula*, *Pinus edulis*, *Muhlenbergia montana*, *Bouteloua gracilis*, and *Robinia neomexicana* phases. More classification review is needed to further define the relationships between these phases and other similar plant associations.

#### DYNAMICS

##### Globally

*Pinus ponderosa* is a drought-resistant, shade-intolerant conifer that when mature has thick bark that allows it to withstand ground fires (Bradley et al. 1992). Natural fire frequency is estimated to be 3-20 years for this community (Youngblood and Mauk 1985). *Quercus gambelii* is a fire-adapted species with a well developed root system that draws moisture from a large volume of soil, and allows for rapid resprouting after fire (Clary 1992). Both species are well-adapted to relatively frequent ground fires that prevent *Pseudotsuga menziesii* or *Abies concolor* from regenerating.

These woodlands grade into *Abies concolor* / *Quercus gambelii* Forest (CEGL000261) or *Pseudotsuga menziesii* / *Quercus gambelii* Forest (CEGL000452) as sites become cooler and wetter (DeVelice et al. 1986). Mosaics of *Pinus ponderosa* stands with grass- or oak-dominated understories occur in response to different substrates with *Quercus gambelii* dominating the rocky sites and grass understory woodland types (*Festuca* spp., *Muhlenbergia montana*) in areas with deeper soils (DeVelice et al. 1986, Peet 1981).

#### REFERENCES

Alexander et al. 1984, Alexander et al. 1987, Bader 1932, Blackburn et al. 1969, Bourgeron and Engelking 1994, Bradley et al. 1992, Bunin 1975, Clary 1992, DeVelice et al. 1986, Diamond 1993, Dixon 1935, Donart et al. 1978, Driscoll et al. 1984, Fitzhugh et al. 1987, Hanks et al. 1983, Hanson and Ball 1928, Harmon 1980, Helm 1977, Hess and Wasser 1982, Madany and West 1980, Muldavin et al. 1996, Johnston 1987, Johnston and Hendzel 1985, Larson and Moir 1987, Marr et al. 1973, Muldavin et al. 1996, Peet 1975, Peet 1981, Roberts et al. 1992, Schmoll 1935, Somers et al. 1980, Stuever and Hayden 1997b, Savage and Swetnam 1990, Terwilliger et al. 1979a, USFS 1983b, Wasser and Hess 1982, Wright et al. 1973, Youngblood and Mauk 1985

#### Note:

This association is found in two different map classes:

- 1) [Canyon Floor Complex](#)
- 2) [Ponderosa Pine / Gambel Oak Woodland](#)